STB Self-Checking Optical Touch Buttons

STB Self-Checking Optical Touch Button Features

- Diverse-redundant microcontroller-based photoelectric touch buttons
- Continuous internal self-checking operation
- Ergonomically designed to eliminate hand, wrist and arm stresses associated with repeated switch operation; require no physical pressure to operate
- Immune to ambient light, EMI and RFI interference
- High excess gain cuts through heavy contamination
- Yellow field cover included
- LED power, output and fault indicators

STB Series Touch Button Models

<table>
<thead>
<tr>
<th>Models</th>
<th>Cable</th>
<th>Upper Housing</th>
<th>Supply Voltage</th>
<th>Output Type</th>
<th>DUO-TOUCH® SG Compatibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>STBVP6</td>
<td>4-wire 2 m (6.5') integral cable</td>
<td>10 to 30V dc</td>
<td>Complementary PNP</td>
<td></td>
<td>AT-FM-10K Two-hand control module</td>
</tr>
<tr>
<td>STBVP6Q</td>
<td>4-Pin Mini-style QD</td>
<td>Polysulfone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBVP6Q5</td>
<td>4-Pin Euro-style QD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBVR81</td>
<td>5-wire 2 m (6.5') integral cable</td>
<td>20 to 30V ac/dc</td>
<td>Two Individual Complementary Relays (see Figure 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBVR81Q</td>
<td>5-Pin Mini-style QD</td>
<td>Lexan®</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBVR81Q6</td>
<td>5-Pin Euro-style QD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBVP6L</td>
<td>4-wire 2 m (6.5') integral cable</td>
<td>10 to 30V dc</td>
<td>Complementary PNP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBVP6LQ</td>
<td>4-Pin Mini-style QD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBVP6LQ5</td>
<td>4-Pin Euro-style QD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBVR81L</td>
<td>5-wire 2 m (6.5') integral cable</td>
<td>20 to 30V ac/dc</td>
<td>Two Individual Complementary Relays (see Figure 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBVR81LQ</td>
<td>5-Pin Mini-style QD</td>
<td>Lexan®</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBVR81LQ6</td>
<td>5-Pin Euro-style QD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:

i) 9 m (30') cables are available by adding suffix “W/30” to the model number of any cabled STB (e.g., STBVP6 W/30)

ii) QD models require an accessory QD cable. See page 10 for more information.

WARNING ... Not a Stand-Alone Safety Device

STB Series Touch Buttons are self-checking ergonomic actuating devices, but are not, by themselves, safety devices. To be used in a safety application, two STBs must be interfaced with a type IIIC two-hand-control module, such as the Banner AT-FM-10K, in order to meet all relevant safety requirements of the appropriate standards.
Important ... read this page before proceeding!

In the United States, Banner’s STB Series Self-Checking Optical Touch Buttons are not by themselves safety devices! If they will be used to initiate potentially dangerous machinery, certain industrial standards and regulations must be followed. Two-hand control functions are regulated by the Occupational Safety and Health Administration (OSHA). Whether or not any particular STB Touch Button installation meets all applicable OSHA requirements depends upon factors that are beyond the control of Banner Engineering Corp. These factors include the specific ways the button is applied, installed, wired, operated, and maintained.

Banner Engineering Corp. has attempted to provide complete application, installation, operation, and maintenance instructions. In addition, we suggest that any questions regarding the use or installation of this Actuation Device be directed to the factory applications department at the telephone numbers or address shown on the back cover of this manual.

The user of this Actuation Device must ensure that all machine operators, maintenance personnel, electricians, and supervisors are thoroughly familiar with and understand all instructions regarding the installation, maintenance, and use of this system, and with the machinery upon which it is installed.

The user and any personnel involved with the installation and use of this Actuation Device must be thoroughly familiar with all appropriate OSHA regulations and ANSI standards. Banner Engineering Corp. makes no claim regarding a specific recommendation of any organization, the accuracy or effectiveness of any information provided, or the appropriateness of the provided information for a specific application.

The user has the responsibility to ensure that all local, state, and national laws, rules, codes, and regulations relating to the use of this Actuation Device are satisfied. We recommend that you carefully check that all legal requirements are met and that all installation and maintenance instructions contained in this manual are followed.

U. S. Standards Applicable to Use of Two-Hand-Control Systems

ANSI B11 Standards for Machine Tools “Safety Requirements for the Construction, Care and Use”
Available from: Safety Director
AMT – The Association for Manufacturing Technology
7901 Westpark Drive
McLean, VA 22102
Tel.: 703-893-2900 Fax: 703-893-1151
NFPA79 “Electrical Standard for Industrial Machinery (1997)”
Available from: National Fire Protection Association
1 Batterymarch Park, P.O. Box 9101
Quincy, MA 02269-9101
Tel.: 800-344-3555
ANSI/RIA R15.06 “Safety Requirements for Industrial Robots and Robot Systems”
Available from: Robotic Industries Association
900 Victors Way, P.O. Box 3724
Ann Arbor, MI 48106
Tel.: 734-994-6088

European Standards Applicable to Use of Two-Hand-Control Systems
EN292-1 “Safety of Machinery – Basic Concepts, General Principals for Design, Part 1: Basic Terminology, Methodology”
EN60204-1 “Electrical Equipment of Machines: Part 1: General Requirements”
Also, request a type “C” standard for your specific machinery.
EN999 “Safety of Machinery – The Positioning of Protective Equipment”
EN574 “Safety of Machinery – Two-Hand-Control Devices”
Available from: Global Engineering Documents
15 Inverness Way East
Englewood, CO 80112-5704
Tel.: 800-854-7179
STB Series Self-Checking Optical Touch Buttons

STB Self-Checking Optical Touch Buttons are touch-activated photoelectric devices designed to replace capacitive touch switches and mechanical push buttons. Their outputs activate while a finger is in the “touch area” (yoke) of the switch, interrupting the button's infrared sensing beam.

Banner STB Series buttons are ergonomically designed to eliminate the hand, wrist, and arm stresses associated with mechanical push buttons. They require absolutely no physical pressure to operate. LED indicators light when power is on and outputs are activated.

All models are immune to EMI, RFI, and ambient light interference. STBs have either a black polysulfone or red Lexan® upper housing (depending on model) and yellow PBT base. Environmental considerations for use of the two types differ; see specifications. The 30 mm threaded base on all models provides easy mounting and easy retrofitting into existing applications.

STB Self-Checking Optical Touch Buttons are identical in fit, form and function with the proven and popular OTB Series buttons. The internal design of the new buttons, however, based on dual microcontrollers, allows the hookup to a Banner DUO-TOUCH SG Two-Hand-Control Safety Module, or other two-hand-control designed to meet Type IIIC requirements per EN 574 (requiring 1 normally open and 1 normally closed contact per input channel).

STB Series Touch Button LED Indicators

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power ON (green)</td>
<td>Steady ON when power is applied</td>
</tr>
<tr>
<td>Output, Fault (green)</td>
<td>OFF when button is not activated</td>
</tr>
<tr>
<td></td>
<td>Flashing when a fault condition is detected</td>
</tr>
</tbody>
</table>

Rugged yellow polypropylene (TP) field covers are supplied with all models to prevent inadvertent switch actuation due to objects (such as loose clothing or debris) which might accidentally block the sensing beam. The polypropylene material is capable of absorbing high impact (even at low temperatures) and is highly resistant to abrasion and to damage by most chemicals.

WARNING ... Point-of-Operation Guarding

When properly installed, a two-hand-control system using STB Touch Buttons as the actuating devices provides protection only for the hands of the machine operator. It may be necessary to install other guarding devices, such as safety light screens and/or hard guards, to protect personnel from hazardous machinery. Failure to install appropriate point-of-operation guards on hazardous machinery can result in a dangerous condition which could lead to serious injury or death.
STB Series Self-Checking Optical Touch Buttons

STB Series Touch Button Installation

STB Series Self-Checking Touch Buttons were designed primarily to provide the self-checking function required in control-reliable machine cycle initiation applications. However, STBs are suitable for use anywhere mechanical push buttons or the original OTB Touch Buttons are being used today.

Both the solid-state and relay-output versions have complementary outputs and can be connected to switch power to equipment as long as the STB's switching voltage and current limits are not exceeded (see output ratings, page 8).

STBs must be connected to a type IIIC Two-Hand-Control circuit module, in most cases, when used to initiate potentially dangerous machine cycles.

Mechanical Installation

OSHA and ANSI require that the hand controls be mounted to protect them from accidental or unintentional operation. Use shields, covers, rings, collars, dividers, or similar protection to prevent accidental switch actuation and to discourage use of forearms or elbows. European standard EN 574 includes a detailed discussion of approaches to protection of hand controls.

The hand controls must be arranged to require the use of both hands for simultaneous actuation. They must be located far enough apart so that the operator cannot operate both hand controls by the use of one arm.

Figure 2 shows two methods for mounting the STB Touch Buttons. When mounted on top of the control bar, the protective field covers should be in place, as shown. For added protection, mount the STB Touch Buttons sideways under and behind a protective hood, rather than on top of the bar. This side mount prevents the operator from positioning and leaving an object in the path of the beam, intentionally bypassing the safeguard.

![Top Mount, with Field Covers in Place](image1)

![Side Mount, with Field Covers Removed](image2)

Figure 2. Install STB Buttons so that they are protected to prevent defeat or inadvertent actuation

CAUTION ... Install Hand Controls to Prevent Accidental Actuation

Total protection for the two-hand-control system from "defeat" is not possible. However, the user is required by OSHA regulations to arrange and protect hand controls to minimize possibility of defeat or accidental actuation.

WARNING ... Not a Stand-Alone Safety Device

STB Series Touch Buttons are Self-Checking ergonomic actuating devices, but are not, by themselves, safety devices. To be used in a safety application, the STB must be interfaced with a type IIIC two-hand-control module, such as the Banner AT-FM-10K, in order to meet all relevant safety requirements of the appropriate standards.
Separation Distance
Both hand controls must be located far enough away from the nearest hazard point that the operator cannot reach the hazard with a hand or other body part before the hazardous motion ceases (ANSI B11.19, 4.2.4.3.2). This is the “separation distance,” and may be calculated as follows [see OSHA CFR 1910.217 (c) (3) (vii) & (viii)].

For Part-Revolution Clutch Machinery
Where the machine and its controls allow the machine to stop motion during the hazardous portion of the machine cycle, use the following formula:

\[ D_s = K \times (T_s + T_r + T_h) \]

For Full-Revolution Clutch Machinery
Where the machine and its controls are designed to complete a full machine cycle, once activated, use the following formula:

\[ D_s = K \times (T_m + T_r + T_h) \]

For both formulas:
- \( D_s \) = the separation distance in inches,
- \( K \) = 63” per second (the hand speed constant currently accepted by OSHA; see NOTE 1, below),
- \( T_s \) = the stop time (in seconds) of the machine, measured from the application of the “stop” signal to the final ceasing of all motion, including stop times of all relevant control elements, and measured at maximum machine velocity (see NOTE 2, below),
- \( T_r \) = the response time of the Two-Hand-Control safety module as measured from the time either hand disengages a hand control
- \( T_h \) = the response time of the slowest hand control (from the time when a hand disengages that control until the switch opens; see NOTE 3, below)
- \( T_m \) = the maximum time (in seconds) the machine takes to cease all motion after it has been tripped. For full-revolution clutch presses with only one engaging point, \( T_m \) is equal to the time necessary for one and one-half revolutions of the crankshaft. For full-revolution clutch presses with more than one engaging point, \( T_m \) is calculated as follows:
  \[ T_m = \left( \frac{1}{2} + \frac{1}{N} \right) \times T_{cy} \]
  where:
  - \( N \) = number of clutch engaging points per revolution
  - \( T_{cy} \) = time (in seconds) necessary to complete one revolution of the crankshaft

NOTES:
1) The OSHA-recommended hand speed constant \( K \) has been determined by various studies, and although these studies indicate speeds of 63”/sec to over 100”/sec, they are not conclusive determinations. The employer should consider all factors, including the physical ability of the operator, when determining the value of \( K \) to be used.
2) \( T_s \) is usually measured by a stop-time measuring device. If the specified machine stop time is used, add at least 20% as a safety factor to account for brake system deterioration. If the stop-time of the two redundant machine control elements is unequal, the slower of the two times must be used for calculating the separation distance.
3) \( T_h \) is usually insignificant for purely mechanical switches. However, \( T_h \) should be considered for separation distance calculation when using electronic or electromechanical (i.e. powered) hand controls.
WARNING ... Safety Systems Used for Two-Hand-Control

In a two-hand-control/trip system that incorporates STB Touch Buttons as the actuation devices and functions as a safeguard, the anti-tiedown and simultaneity monitoring functions should not be performed by a non-safety-related device (e.g., a PLC or PC). Per OSHA 29CFR1910.211(d)(62), the “safety system must...operate together as a unit, such that a single failure or single operating error will not cause injury to personnel due to point-of-operation hazards.”

Refer to the appropriate standard to determine the requirements of a two-hand-control/trip system when used for safeguarding. See page 2 for a partial list of standards.

Figure 3. STB Touch Button block diagrams
Figure 4. Generic interface of a relay-output STB Touch Button to a type IIIC two-hand-control module.
Figure 5. STB Touch Button dimensions
# STB Touch Button Specifications

| **Supply Voltage and Current** | STBVP6 Models: 10 to 30V dc  
STBVR81 Models: 20 to 30V ac/dc |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply Protection Circuitry</strong></td>
<td>Protected against transient voltages and reverse polarity</td>
</tr>
</tbody>
</table>
| **Output Configuration** | STBVP6 Models: Complementary PNP (sourcing) open-collector transistors  
STBVR81 Models: Complementary electromechanical relays |
| **Output Rating** | **STBVP6 Models (solid-state outputs):**  
Maximum load: 150 mA  
On-state saturation voltage: ≤ 15V @ full load  
Off-state leakage current: < 1 µA  
**STBVR81 Models (electromechanical relays):**  
Maximum switching voltage: 150V dc/125V ac  
Maximum switching current: 1A  
Maximum resistive power: 30W dc/60VA ac  
Mechanical life of relays: 10^6 cycles  
Electrical life of relays: 3 x 10^6 cycles at 1 amp, 24V resistive |
| **Output Protection** | All models protected against false pulse on power-up. Models with solid-state outputs have overload and short-circuit protection. |
| **Response Time** | 20 milliseconds ON/OFF |
| **Indicators** | 2 green LED indicators:  
Power: CN – power applied  
Output/fault:  
CN – button is activated  
OFF – button is deactivated  
Flashing – internal fault or blocked button on power-up detected |
| **Construction** | Totally encapsulated, non-metallic enclosure. Black polysulfone or red Lexan® upper housing (see Application Note below); fiber-reinforced PBT polyester base. Electronics fully epoxy-encapsulated. Supplied with polypropylene (TP) field cover. |
| **Environmental Rating** | Meets NEMA standards 1, 3, 4, 4X, 12 and 13; IEC IP66 |
| **Connections** | PVC-jacketed 2 m (6.5') cables or QD fitting, depending on model.  
Accessory QD cables required for QD models; see Accessories, page 9.  
**STBVP6 Models:** 4-wire (4-pin Mini-style or Euro-style QD)  
**STBVR81 Models:** 5-wire (5-pin Mini-style or Euro-style QD)  
Integral 9 m (30') cables are also available; see model selection chart, page 1. |
| **Ambient Light Immunity** | Up to 100,000 lux |
| **EMI/RFI Immunity** | Immune to EMI and RFI noise sources, per IEC 947-5-2. |
| **Operating Conditions** | **Temperature:** 0° to +50°C (+32° to +122°F)  
**Maximum relative humidity:** 90% @ +50°C (non-condensing) |
| **Application Notes** | Environmental considerations for models with polysulfone upper housings:  
The polysulfone upper housing will become brittle with prolonged exposure to outdoor sunlight. Window glass effectively filters longer wavelength ultraviolet light and provides excellent protection from sunlight. Avoid contact with strong alkalis. Clean periodically using mild soap solution and a soft cloth.  
Environmental considerations for models with Lexan® upper housings:  
Avoid prolonged exposure to hot water and moist high-temperature environments above 66°C (150°F). Avoid contact with aromatic hydrocarbons (such as xylene and toluene), halogenated hydrocarbons and strong alkalis. Clean periodically using mild soap solution and a soft cloth. |

Lexan® is a registered trademark of General Electric Co.
## STB Series Self-Checking Optical Touch Buttons

### Repairs

**NOTE:** Do not attempt any repairs to the STB Touch Buttons. They contain no field-replaceable components. Return them to the factory for warranty repair or replacement.

If it ever becomes necessary to return an STB Touch Button to the factory, please do the following:

1) Contact the Banner Factory Application Engineering Group at the address or at the numbers listed at the bottom of the back page. They will attempt to troubleshoot the system from your description of the problem. If they conclude that a component is defective, they will issue an RMA (Return Merchandise Authorization) number for your paperwork, and give you the proper shipping address.

2) Pack the components carefully. Damage which occurs in return shipping is not covered by warranty.

### Accessories

#### STB Touch Button Quick-Disconnect (QD) Cables

<table>
<thead>
<tr>
<th>Style</th>
<th>Model</th>
<th>Length</th>
<th>Used with:</th>
<th>Pin-out</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-Pin Mini Female Pin-out Straight</td>
<td>MBCC-406</td>
<td>2 m (6.5')</td>
<td>All STB Mini-Style QD models with solid-state outputs</td>
<td>![Pin-outs](white: Black Wire, Blue Wire, Brown Wire)</td>
</tr>
<tr>
<td></td>
<td>MBCC-412</td>
<td>4 m (12')</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MBCC-430</td>
<td>9 m (30')</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-Pin Mini Female Pin-out Straight</td>
<td>MBCC-506</td>
<td>2 m (6.5')</td>
<td>All STB Mini-Style QD models with electromechanical relay outputs</td>
<td>![Pin-outs](white: Black Wire, Blue Wire, Brown Wire)</td>
</tr>
<tr>
<td></td>
<td>MBCC-512</td>
<td>4 m (12')</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MBCC-530</td>
<td>9 m (30')</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-Pin Euro Female Pin-out Straight</td>
<td>MQDC-406</td>
<td>2 m (6.5')</td>
<td>All STB Euro-Style QD models with solid-state outputs</td>
<td>![Pin-outs](brown: Black Wire, Blue Wire, White Wire)</td>
</tr>
<tr>
<td></td>
<td>MQDC-415</td>
<td>5 m (15')</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MQDC-430</td>
<td>9 m (30')</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-Pin Euro Female Pin-out Straight</td>
<td>MQDC1-506</td>
<td>2 m (6.5')</td>
<td>All STB Euro-Style QD models with electromechanical relay outputs</td>
<td>![Pin-outs](brown: Black Wire, Blue Wire, Gray Wire)</td>
</tr>
<tr>
<td></td>
<td>MQDC1-515</td>
<td>5 m (15')</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MQDC1-530</td>
<td>9 m (30')</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Mounting Brackets

<table>
<thead>
<tr>
<th>SMB30C</th>
<th>SMB30MM</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 30 mm split clamp bracket</td>
<td>• 30 mm, 12-gauge, stainless steel bracket with curved mounting slots for versatility and orientation</td>
</tr>
<tr>
<td>• Black reinforced thermoplastic polyester</td>
<td>• Clearance for M6 (1/4”) hardware</td>
</tr>
<tr>
<td>• Includes stainless steel mounting hardware</td>
<td></td>
</tr>
</tbody>
</table>

#### SMB30C
- **30 mm split clamp bracket**
- **Black reinforced thermoplastic polyester**
- **Includes stainless steel mounting hardware**

![SMB30C Diagram](image)

#### SMB30S
- **30 mm swivel bracket**
- **Black reinforced thermoplastic polyester**
- **Includes stainless steel mounting and swivel locking hardware**

![SMB30S Diagram](image)

#### SMB30SC
- **30 mm swivel bracket**
- **Black reinforced thermoplastic polyester**
- **Includes stainless steel mounting and swivel locking hardware**

![SMB30SC Diagram](image)

#### SMB30MM
- **30 mm, 12-gauge, stainless steel bracket with curved mounting slots for versatility and orientation**
- **Clearance for M6 (1/4”) hardware**

![SMB30MM Diagram](image)
DUO-TOUCH® Run Bar with STB Buttons

Self-Checking Ergonomic Actuating Devices

Features

- Ergonomic design for reduced hand, wrist, and arm stresses associated with repeated switch operation; requires no physical pressure to operate
- Designed to minimize the possibility of defeat and accidental actuation
- Designed to comply with ANSI B11.19 and ISO 13851 (EN 574)
- Robust 13 gauge (0.090") cold-rolled steel construction
- Two diverse-redundant microcontroller-based photoelectric STB self-checking touch buttons:
  - Continuous internal self-checking operation
  - Immunity to ambient light, EMI and RFI interference
  - High excess gain to cut through heavy contamination
  - LED power, output, and fault indicators
- Emergency stop button on some models
- Designed to be interfaced with DUO-TOUCH SG two-hand control modules or other control systems that comply, at minimum, with ANSI NFPA 79 or IEC 60204-1 two-hand control requirements (e.g., anti-tie down)
- Accessory EZ-LIGHT™ with blue, red, green, and amber LEDs available
- Accessory brackets and telescoping floor-mounted stands available

Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Run Bar Description</th>
<th>Touch Button Description</th>
<th>E-Stop Button</th>
<th>Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>STBVP6-RB1</td>
<td>DUO-TOUCH Run Bar, metal construction</td>
<td>Two model STBVP6 optical touch buttons (solid-state complementary PNP outputs, polysulfone upper housing)</td>
<td>Not included</td>
<td>Terminal strip connection</td>
</tr>
<tr>
<td>STBVP6-RB1E02</td>
<td></td>
<td></td>
<td>Model SSA-EBM-02L</td>
<td>E-stop button (two NC safety contacts)</td>
</tr>
<tr>
<td>STBVP6-RB1Q8</td>
<td></td>
<td></td>
<td>Not included</td>
<td>8-pin Mini-style QD</td>
</tr>
<tr>
<td>DUO-TOUCH® Run Bar Kits</td>
<td>Call for assistance and availability</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* See page 12 for brackets and stand options.

WARNING . . . Not a Stand-Alone Safety Device

STB Series Touch Buttons are self-checking ergonomic actuating devices, but are not, by themselves, safety devices. To be used in a safety application, two STBs must be interfaced with a type IIIC two-hand-control module or system, such as the Banner AT-FM-10K, in order to meet all relevant safety requirements of the appropriate standards.
DUO-TOUCH® Run Bar with STB Buttons

⚠️ Important ... read this page before proceeding!

In the United States, the functions that a Banner DUO-TOUCH Two-Hand Control System is intended to perform are regulated by the Occupational Safety and Health Administration (OSHA). Whether or not any particular DUO-TOUCH SG Two-Hand Control installation meets all applicable OSHA requirements depends upon factors that are beyond the control of Banner Engineering Corp. These factors include the specific ways the system is applied, installed, wired, operated, and maintained.

Banner Engineering Corp. has attempted to provide complete application, installation, operation, and maintenance instructions. In addition, we suggest that any questions regarding the use or installation of this two-hand control safety system be directed to the factory applications department at the telephone numbers or address shown on the back cover of this manual.

The user of this Two-Hand Control safety system must ensure that all machine operators, maintenance personnel, electricians, and supervisors are thoroughly familiar with and understand all instructions regarding the installation, maintenance, and use of this system, and with the machinery upon which it is installed.

The user and any personnel involved with the installation and use of this safety system must be thoroughly familiar with all applicable OSHA regulations and ANSI standards. The regulations and standards, listed below, directly address the use of two-hand control systems. Banner Engineering Corp. makes no claim regarding a specific recommendation of any organization, the accuracy or effectiveness of any information provided, or the appropriateness of the provided information for a specific application.

The user has the responsibility to ensure that all local, state, and national laws, rules, codes, and regulations relating to the use of this Two-Hand Control system are satisfied. Extreme care is urged that all legal requirements are met and that all installation and maintenance instructions contained in this manual are followed.

### U. S. Standards Applicable to Use of Two-Hand Control Systems

- **ANSI B11**
  - Standards for Machine Tools “Safety Requirements for the Construction, Care and Use”
  - Available from: Safety Director
  - AMT – The Association for Manufacturing Technology
  - 7901 Westpark Drive
  - McLean, VA 22102
  - Tel.: 703-893-2900  Fax: 703-893-1151

- **NFPA79**
  - “Electrical Standard for Industrial Machinery”
  - Available from: National Fire Protection Association
  - 1 Batterymarch Park, P.O. Box 9101
  - Quincy, MA 02269-9101
  - Tel.: 800-344-3555

- **ANSIRIA R15.06**
  - “Safety Requirements for Industrial Robots and Robot Systems”
  - Available from: Robotic Industries Association
  - 900 Victors Way, P.O. Box 3724
  - Ann Arbor, MI 48106
  - Tel.: 734-994-6088

### International (European) Standards Applicable to Use of Two-Hand Control Systems

- **ISO/TR12100-1 & -2**
  - “Safety of Machinery – Basic Concepts, General Principals for Design, Part 1: Basic Terminology, Methodology”
  - Part 2: “Technical Principals and Specifications”

- **IEC/EN60204-1**
  - “Electrical Equipment of Machines: Part 1: General Requirements”
  - Also, request a type “C” standard for your specific machinery.

- **ISO13849-1 (EN954-1)**
  - “Safety of Machinery – Safety Related Parts of Control Systems”

- **ISO13855 (EN999)**
  - “Safety of Machinery – The Positioning of Protective Equipment”

- **ISO13851 (EN574)**
  - “Safety of Machinery – Two-Hand Control Devices”

Available from: Global Engineering Documents
- 15 Inverness Way East
- Englewood, CO 80112-5704
- Tel.: 800-854-7717

Phone: 800.894.0412 - Fax: 888.723.4773 - Web: www.clrwtr.com - Email: info@clrwtr.com
Description

The DUO-TOUCH® Run Bar with STB Self-Checking Optical Touch Buttons is designed to satisfy the ergonomic principles found in ANSI B11.TR1 to reduce the hand, wrist, and arm stresses associated with mechanical push buttons. The rugged 13-ga. steel housing is designed to prevent inadvertent switch actuation due to objects (such as loose clothing or debris) which might accidentally block the sensing beam.

The STB Touch Buttons are touch-activated photoelectric devices designed to replace capacitive touch switches and mechanical push buttons. Their outputs activate when a finger is present in the yoke ("touch area") of the switch, interrupting the button's infrared sensing beam. These "buttons" require absolutely no physical pressure to operate, and are immune to EMI, RFI, and ambient light interference (see specifications on page 10).

The STB button's internal design incorporates dual microcontrollers, allowing hookup to a Banner DUO-TOUCH SG Two-Hand Control Safety Module (or other two-hand control systems designed to meet Type IIIC requirements per ISO 13851 (EN 574), and ISO 13849-1 category 4 requirements).

The microcontrollers in the STB buttons perform a continuous self-check: the emitter is continuously pulsed, and receiver response is checked accordingly by the microcontrollers. STB touch buttons are designed to immediately detect any internal component failure, go into lockout mode, and indicate the failure with a flashing red Fault LED.

STB Series Touch Button LED Indicators

Power On (green): Steady ON when power is applied

Output, Fault (green): Steady ON when button is activated
                          OFF when button is not activated
                          Flashing when a fault condition is detected
Appropriate Applications

The DUO-TOUCH Run Bar is intended for use as the initiation device in a two-hand control system for most powered machinery, when machine cycling is controlled by an individual.

The two-hand control system makes the operator a “hostage” while the hazard is present, thus limiting or preventing exposure of that operator to the hazard (see Warning at right). The two-hand control actuators must be located in a way that hazardous motion is completed or stopped before the operator can release one or both of the buttons and reach the hazard (see Separation Distance on page 6).

Two-hand control systems must meet requirements found in several U.S. and international standards. See the machine-specific standard (e.g., “C-level” in ISO/EN standards), ANSI NFPA 79, IEC 60204-1, ANSI B11.19, and ISO 13851 (EN 574) for complete information. Some of the requirements are:

• Simultaneous use of both hands (“synchronous action”): both buttons must be actuated within 500 ms of one another, even under single-fault conditions. Whenever this time is exceeded, both actuating devices must be released. This requirement reduces the possibility of intentional defeat and unintended initiation.

• Continuous actuation of both buttons during the hazardous situation. Releasing one or both buttons must cause the ceasing of the hazardous situation, and before the machine cycle can continue, both buttons must be released.

• When used in single-cycle or single-stroke mode, the machine control must provide an anti-repeat feature so that the operator must release the two-hand control actuators after each machine cycle, before a new cycle can be initiated.

• The actuating devices must be protected from accidental or unintended operation.

• When used for safeguarding, the interfacing must be at an appropriate level of safety circuit integrity as determined by a risk assessment. In the U.S., the required level of integration is Control Reliability (see ANSI B11.19). In many situations governed by ISO/IEC and EN regulations, the required integration for Type IIIC per ISO 13851 (EN 574) is Category 4 per ISO 13849-1 (EN 954-1).

To assist in complying with the above requirements, Banner Engineering recommends interfacing the STB buttons of the run bar with a DUO-TOUCH SG Two-Hand Control Module, such as the model AT-FM-10K, AT-.M-13A, or AT-.M-11KM, or other Type IIIC-compliant two-hand control system. See Warnings on front page and at right.
Mechanical Installation
Mount the DUO-TOUCH Run Bar in a way that maximizes its ergonomic design and minimizes the possibility of defeat. To minimize the possibility of defeat, ISO 13851 (EN 574) recommends that the hand controls be arranged on a horizontal (or nearly horizontal) surface, 1100 mm (43.3") above the floor. The Run Bar makes this installation easy.

To maximize ergonomics, ANSI B11.TR1 recommends that for light to normal work the position should be 50 to 100 mm (2" to 4") above or below elbow height. Elbow height should be determined and adjusted for each individual operator. Anthropometric tables provide a range for guidance (see ANSI B11.TR1 Annex A):

<table>
<thead>
<tr>
<th>Elbow Height (to floor, without shoes)</th>
<th>5%</th>
<th>95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male/Female</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39.2&quot; / 36.5&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Millimeters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male/Female</td>
<td></td>
<td></td>
</tr>
<tr>
<td>995 / 926 mm</td>
<td></td>
<td>1153 / 1074 mm</td>
</tr>
</tbody>
</table>

Tilting the run bar (using the bracket’s multiple-hole adjustment) can allow for varying operator heights, while maintaining a neutral wrist position. This rotation should not exceed ±30°, especially when an emergency stop button is mounted on the top of the run bar. Hand and wrist posture is considered to be neutral when the hand is neither flexed nor extended beyond about 15° of the normally relaxed position.

Per ANSI B11.TR1, the most desirable location for controls used by a standing operator is a position directly in front of the operator, and at a height between chest and waist level. Frequent reaches should nominally be made within 350 to 450 mm (14" to 18") from the center of the shoulder to the run bar. Only occasional reaches should be made within 550 to 650 mm (22" to 26"); avoid reaches farther than 650 mm (26"), see Figure 2.

Figure 1. Run Bar location

Figure 2. ANSI B11.TR1-recommended maximum-reach distances
Example Separation Distance (D_s) Calculation

The following example illustrates the use of the formula to calculate separation distance for a part-revolution clutch machine. This example uses 0.50 seconds as a typical value for T_s and 0.02 seconds for T_h:

\[
\begin{align*}
K &= 63^{\circ} \text{ per second}, \\
T_s &= 0.50 \text{ seconds (measured by a stop-time measuring device)}, \\
T_r &= 0.035 \text{ seconds}, \\
T_h &= 0.02 \text{ seconds}, \\
D_s &= K \times (T_s + T_r + T_h) \\
&= 63^{\circ} \times (0.50 + 0.035 + 0.02) \\
&= 35^{\circ}
\end{align*}
\]

In this example, both hand controls must be located no closer than 36” from the nearest hazard point.

WARNING . . . Location of Touch Button Controls

Hand controls must be mounted a safe distance from moving machine parts, as determined by the appropriate standard. It must not be possible for non-qualified persons to relocate them. Failure to establish and maintain the required safety distance could result in serious injury or death.

Separation Distance

Both hand controls must be located far enough away from the nearest hazard point that the operator cannot reach the hazard with a hand or other body part before the hazardous motion ceases. This is the “separation distance,” and may be calculated as follows.

For Part-Revolution Clutch Machinery

Where the machine and its controls allow the machine to stop motion during the hazardous portion of the machine cycle, use the following formula.

\[
D_s = K \times (T_s + T_r + T_h)
\]

For Full-Revolution Clutch Machinery

Where the machine and its controls are designed to complete a full machine cycle, once activated, use the following formula:

\[
D_s = K \times (T_m + T_r + T_h)
\]

For both formulas:

\[
\begin{align*}
D_s &= \text{the separation distance in inches}, \\
K &= 63^{\circ} \text{ per second (the hand speed constant currently accepted by OSHA; see NOTE 1, below)}, \\
T_s &= \text{the stop time (in seconds) of the machine, measured from the application of the “stop” signal to the final ceasing of all motion, including stop times of all relevant control elements, and measured at maximum machine velocity (see NOTE 2)}, \\
T_r &= \text{the response time of the Safety Module as measured from the time a stop is signalled by either hand control. (Banner AT.. Series IIIc two-hand control Safety Modules approx. 0.035 seconds)}, \\
T_h &= \text{the response time of the slowest hand control (from the time when a hand dis-engages that control until the switch opens; see NOTE 3)}, \\
T_m &= \text{the maximum time (in seconds) the machine takes to cease all motion after it has been tripped. For full-revolution clutch presses with only one engaging point, } T_m \text{ is equal to the time necessary for one and one-half revolutions of the crankshaft. For full-revolution clutch presses with more than one engaging point, } T_m \text{ is calculated as follows:} \\
T_m &= \left(1/2 + 1/N\right) \times T_{cy} \\
\text{where:} \\
N &= \text{number of clutch engaging points per revolution} \\
T_{cy} &= \text{time (in seconds) necessary to complete one revolution of the crankshaft}
\end{align*}
\]

NOTES:

1. The OSHA-recommended hand speed constant K has been determined by various studies, and although these studies indicate speeds of 63”/sec to over 100”/sec, they are not conclusive determinations. The employer should consider all factors, including the physical ability of the operator, when determining the value of K to be used.

2. T_s is usually measured by a stop-time measuring device. If the specified machine stop time is used, add at least 20% as a safety factor to account for brake system deterioration. If the stop-time of the two redundant machine control elements is unequal, the slower of the two times must be used for calculating the separation distance.

3. T_h is usually insignificant for purely mechanical switches. However, T_h should be considered for separation distance calculation when using electronic or electromechanical (i.e. powered) hand controls. In this example, STB response time = 0.02 seconds.
DUO-TOUCH® Run Bar with STB Buttons

CAUTION . . .

Disconnect Power Before Wiring

Always disconnect all power from the DUO-TOUCH SG Safety Module and the machine being controlled before making any wire connections.

Electrical installation of hand controls, the DUO-TOUCH SG Safety Module, and the interconnection to the machine control must be made by qualified personnel and must comply with NEC (National Electrical Code), ANSI/NFPA 79 or IEC 60204-1, and all applicable local standards.

Because the DUO-TOUCH Run Bar can interface with many types of two-hand control systems and machine controls, it is not possible to give exact wiring instructions here. The following guidelines are general in nature.

Electrical Installation

Electrical installation of hand controls, the DUO-TOUCH SG Safety Module, and the interconnection to the machine control must be made by qualified personnel and must comply with NEC (National Electrical Code), ANSI/NFPA 79 or IEC 60204-1, and all applicable local standards.

Because the DUO-TOUCH Run Bar can interface with many types of two-hand control systems and machine controls, it is not possible to give exact wiring instructions here. The following guidelines are general in nature.

Figure 3. Terminal strip connections

Figure 4. Use slots in run bar housing to hold cover for terminal connection

Figure 5. 8-pin mini-style QD connections

8-Pin Mini-Style Output QD Connector
Male Face View

<table>
<thead>
<tr>
<th>Pin</th>
<th>Color</th>
<th>Function</th>
<th>Alternate Color*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brown</td>
<td>+24V dc</td>
<td>Orange</td>
</tr>
<tr>
<td>2</td>
<td>Orange/Black</td>
<td>N.O. STB2</td>
<td>Blue</td>
</tr>
<tr>
<td>3</td>
<td>Orange</td>
<td>N.C. STB2</td>
<td>White/Black</td>
</tr>
<tr>
<td>4</td>
<td>White</td>
<td>N.C. STB1</td>
<td>Black</td>
</tr>
<tr>
<td>5</td>
<td>Black</td>
<td>N.O. STB1</td>
<td>White</td>
</tr>
<tr>
<td>6</td>
<td>Blue</td>
<td>0V dc</td>
<td>Red</td>
</tr>
<tr>
<td>7</td>
<td>Green/Yellow</td>
<td>Gnd/PE</td>
<td>Green</td>
</tr>
<tr>
<td>8</td>
<td>Violet</td>
<td>Not Connected</td>
<td>Red/Black</td>
</tr>
</tbody>
</table>

* Listed as a customer courtesy. Verify suitability of these cables for each application.
Connection of STB Touch Buttons
To maintain a Type IIIC / Category 4 hookup, both the normally open and the normally closed outputs of each STB button must be connected to a two-hand control system or module (e.g., Banner model AT-FM-10K, AT-..M-13A, or AT-..M-11KM) that meets the requirements listed on page 4 and monitors the STB outputs such that if they are not in a complementary state (one open/non-conducting and one closed/conducting) the system will lock out and prevent further operation until the fault is repaired.

The +24V dc supply power for the STB buttons must be the same supply that powers the two-hand control system or module. If a DUO-TOUCH SG safety module is used, use terminals Z1 and Z2 for supply voltage for the STB buttons.

Connection of Emergency Stop Button
For models with an E-stop button, connection of the E-stop button is made at the screw terminals on the contact element mounted on the mounting adapter.

WARNING . . .
Multiple E-Stop Switches
Whenever two or more E-stop switches are connected to the same E-stop safety module, the contacts of both switches must be connected together in series. This series combination is then wired to the respective safety module input. Never connect the contacts of multiple E-stop switches in parallel to the E-stop safety module inputs; this defeats the switch contact monitoring ability of the safety module, and creates an unsafe condition which could result in serious injury or death.
Checkout Procedures

Checkout procedures are dependent on what two-hand control system or module is interfaced with the DUO-TOUCH Run Bar. At minimum, the procedure should include the requirements on page 4 and the following:

1. Verify that all point-of-operation guards are in place and operating properly.
2. Verify that the two actuating devices must be simultaneously engaged to actuate the machine (within ½ second).
3. For single-cycle machines: Verify that maintained engagement of the two actuating devices results in only one machine cycle.
4. For part-revolution clutch machines: Verify that release of either actuating device results in the immediate arrest of the machine motion.
5. Verify that the distance from each actuating device to the closest hazard point is not closer than the calculated safety distance (see page 6).

Checkout procedures should be accomplished at installation (i.e., commissioning) and at periodic intervals, such as:

— Daily Checkout, to be performed at every power-up, shift change, and machine setup change, and to be performed by a designated person, appointed and identified in writing by the employer.

— Semi-Annual Checkout, to be performed at six-month intervals. This semi-annual checkout must be performed by a qualified person.* A copy of test results should be kept on or near the machine.

* Qualified person: A person who, by possession of a recognized degree or certificate of professional training, or who, by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve problems relating to the installation, maintenance and use of the Two-Hand Control System.

Repairs

NOTE: Do not attempt any repairs to the STB Series touch buttons. They contain no field-replaceable components. Return them to the factory for warranty repair or replacement.

If it ever becomes necessary to return an STB Series touch button to the factory, please do the following:

1. Contact the Banner Factory Application Engineering Group at the address or at the numbers listed at the bottom of the back page. They will attempt to troubleshoot the system from your description of the problem. If they conclude that a component is defective, they will issue an RMA (Return Merchandise Authorization) number for your paperwork, and give you the proper shipping address.

2. Pack the components carefully. Damage which occurs in return shipping is not covered by warranty.
# DUO-TOUCH® Run Bar with STB Buttons

## Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply Voltage and Current</strong></td>
<td>10 to 30V dc</td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td>approx. 1.8W @ 24V dc (with no output load), for each STB</td>
</tr>
<tr>
<td><strong>Supply Protection Circuitry</strong></td>
<td>Protected against transient voltages and reverse polarity</td>
</tr>
<tr>
<td><strong>Output Configuration</strong></td>
<td>Complementary PNP (sourcing) open-collector transistors</td>
</tr>
<tr>
<td><strong>Output Rating</strong></td>
<td>Maximum load: 150 mA</td>
</tr>
<tr>
<td></td>
<td>On-state saturation voltage: ≤ 15V @ full load</td>
</tr>
<tr>
<td></td>
<td>Off-state leakage current: &lt; 1 µA</td>
</tr>
<tr>
<td><strong>Output Protection Circuitry</strong></td>
<td>Protected against false pulse on power-up; overload and short-circuit protection.</td>
</tr>
<tr>
<td><strong>Output Response Time</strong></td>
<td>20 milliseconds ON/OFF</td>
</tr>
<tr>
<td><strong>STB Indicators</strong></td>
<td>2 green LED indicators:</td>
</tr>
<tr>
<td></td>
<td>Power: ON – power applied</td>
</tr>
<tr>
<td></td>
<td>OFF – button is deactivated</td>
</tr>
<tr>
<td></td>
<td>Flashing – internal fault or blocked button on power-up detected</td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td>STB Buttons: Totally encapsulated, non-metallic enclosure; black polysulfone yoke housing (see Application Note below); fiber-reinforced polyester base; electronics fully epoxy-encapsulated.</td>
</tr>
<tr>
<td></td>
<td>E-Stop Button: Polyamide red button with metal base.</td>
</tr>
<tr>
<td></td>
<td>Run Bar Housing: 13 ga (0.090&quot;) cold rolled steel with powder coat paint; polypropylene copolymer STB mount.</td>
</tr>
<tr>
<td><strong>Environmental Rating</strong></td>
<td>STB buttons meet IP66</td>
</tr>
<tr>
<td></td>
<td>E-Stop Button meets IP65</td>
</tr>
<tr>
<td></td>
<td>Run Bar housing meets IP20</td>
</tr>
<tr>
<td><strong>Connections</strong></td>
<td>Models STBVP6-RB1 and -RB1E02: Terminal strip connections inside run bar housing (STBs are pre-wired).</td>
</tr>
<tr>
<td></td>
<td>E-stop button and EZ-LIGHT indicator (if used) are wired separately.</td>
</tr>
<tr>
<td></td>
<td>Models STBVP6-RB1Q8: 8-pin Mini-style quick-disconnect fitting</td>
</tr>
<tr>
<td><strong>Ambient Light Immunity</strong></td>
<td>Up to 100,000 lux</td>
</tr>
<tr>
<td><strong>EMI/RFI Immunity</strong></td>
<td>Immune to EMI and RFI noise sources, per IEC 947-5-2.</td>
</tr>
<tr>
<td><strong>Operating Conditions</strong></td>
<td>Temperature: 0º to +50º C (+32º to +122º F)</td>
</tr>
<tr>
<td></td>
<td>Maximum relative humidity: 90% @ +50º C (non-condensing)</td>
</tr>
<tr>
<td><strong>Application Notes</strong></td>
<td>Environmental considerations:</td>
</tr>
<tr>
<td></td>
<td>The STB’s polysulfone upper housing will become brittle with prolonged exposure to outdoor sunlight. Window glass effectively filters longer wavelength ultraviolet light and provides excellent protection from sunlight. Avoid contact with strong alkalis. Clean periodically using mild soap solution and a soft cloth. (Polycarbonate STB models are also available for use with the Run Bar; contact Factory for assistance.)</td>
</tr>
</tbody>
</table>

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Phone: 800.894.0412 - Fax: 888.723.4773 - Web: www.clrwtr.com - Email: info@clrwtr.com
## DUO-TOUCH® Run Bar with STB Buttons

### Accessories

#### Mounting Brackets

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Product</th>
</tr>
</thead>
</table>
| STBA-RB1-MB1 | • Pair of wall-mount brackets; run bar “hangs” on vertical surface  
• Slotted holes for vertical adjustment  
• Made of 12 ga cold-rolled steel with black powdercoat paint | ![STBA-RB1-MB1](image1.png) |
| STBA-RB1-MB2 | • Universal-mount bracket; allows run bar to mount to vertical stand or surface  
• Slotted holes for adjustment  
• Made of 12 ga cold-rolled steel with black powdercoat paint | ![STBA-RB1-MB2](image2.png) |
| STBA-RB1-MB3 | • Swivel-mount bracket; mounts to telescoping stands below  
• Holes for radial adjustment, 0°–30° in 10° increments  
• Made of 12 ga cold-rolled steel with black powdercoat paint  
• Replacement part; included with telescoping stands STBA-RB1-S1 and STBA-RB1-S2 | ![STBA-RB1-MB3](image3.png) |

#### Telescoping Stands

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Product</th>
</tr>
</thead>
</table>
| STBA-RB1-S1 | • Floor-mounted, telescoping stand; locates touch buttons 800 to 1232 mm  
(31.5” to 48.5”) above the floor surface  
• 150 mm (5.9”) square stationary floor base with 4 mounting holes in corners  
• Telescoping square tubes made of 12 ga cold-rolled steel; base 1/4” cold-rolled steel; black powdercoat paint  
• Includes swivel-mount bracket STBA-RB1-MB3 to mount Run Bar  
• See data sheet 132284 to more information | ![STBA-RB1-S1](image4.png) |
| STBA-RB1-S2 | • Free-standing, telescoping stand; locates touch buttons 800 to 1232 mm  
(31.5” to 48.5”) above the floor surface  
• 610 x 610 mm (24” x 24”) movable H-shaped floor base with mounting holes 560 mm (22”) apart  
• Telescoping square tubes made of 12 ga cold-rolled steel; U-channel feet are 2”W x 1”H x 1/8” thick cold-rolled steel; black powdercoat paint  
• Includes swivel-mount bracket STBA-RB1-MB3 to mount Run Bar  
• See data sheet 132284 to more information | ![STBA-RB1-S2](image5.png) |
DUO-TOUCH® Run Bar with STB Buttons

Accessories, continued

**EZ-LIGHT for Two-Hand Control**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Product</th>
</tr>
</thead>
</table>
| K50LGCRYB11P| • EZ-LIGHT for Two-Hand Control  
• Four-color indication: red, blue, green, and yellow  
• See data sheet 134100 for more information | K50     |
| T30GRYB11P  |                                                                              | T30     |

**EZ-LIGHT Wiring Table**

<table>
<thead>
<tr>
<th>LED Function</th>
<th>Brown Wire</th>
<th>Gray Wire</th>
<th>Black Wire</th>
<th>White Wire</th>
<th>Typical Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red ON</td>
<td>+V dc</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Stop and/or Not Ready</td>
</tr>
<tr>
<td>Blue ON</td>
<td>+V dc</td>
<td>+V dc</td>
<td>—</td>
<td>—</td>
<td>Stopped, but Ready/Enabled</td>
</tr>
<tr>
<td>Green ON</td>
<td>+V dc</td>
<td>+V dc</td>
<td>+V dc</td>
<td>—</td>
<td>Go</td>
</tr>
<tr>
<td>Yellow ON</td>
<td>+V dc</td>
<td>+V dc</td>
<td>+V dc</td>
<td>+V dc</td>
<td>Mute Condition</td>
</tr>
<tr>
<td>Red Flashing</td>
<td>Any other hookup combination</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>Abnormal State</td>
</tr>
</tbody>
</table>

**NOTES:**
- Blue wire connected to 0V dc
- Supply Voltage and Current = 10 to 30V dc, 60 mA max.

**DUO-TOUCH® SG Two-Hand Control Modules, STB Compatible**

<table>
<thead>
<tr>
<th>Model</th>
<th>Supply Voltage</th>
<th>Inputs</th>
<th>Safety Outputs</th>
<th>Output Rating</th>
<th>Auxiliary Outputs</th>
<th>Muting</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT-FM-10K</td>
<td>24V ac/dc</td>
<td>2 STB</td>
<td>2 N.O.</td>
<td>6 amps</td>
<td>—</td>
<td>—</td>
<td>Removable</td>
</tr>
<tr>
<td>AT-GM-13A</td>
<td>115V ac/24V dc</td>
<td>2 STB</td>
<td>4 N.O.</td>
<td>—</td>
<td>1 NPN, 1 PNP,</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>AT-HM-13A</td>
<td>230V ac/24V dc</td>
<td>2 STB</td>
<td>2 N.O.</td>
<td>—</td>
<td>1 N.C.</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>AT-GM-11KM</td>
<td>115V ac/24V dc</td>
<td>and Muting</td>
<td>2 N.O.</td>
<td>—</td>
<td>1 NPN, 1 PNP,</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>AT-HM-11KM</td>
<td>230V ac/24V dc</td>
<td></td>
<td></td>
<td>—</td>
<td>1 N.C.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N.C. = Normally Closed, N.O. = Normally Open
## Quick-Disconnect (QD) Cables

Power and Input/Output Cordsets*

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Length</th>
<th>Termination</th>
<th>Wire</th>
<th>Banner Cable Pinout/Color Code</th>
<th>SAE H1738-2** Pinout/Color Code</th>
<th>Cordset Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input/Output Cordsets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(female face view)</td>
</tr>
<tr>
<td>QDS-815C</td>
<td>5 m (15')</td>
<td></td>
<td>8 pin</td>
<td>1 Bn</td>
<td>1 Or</td>
<td></td>
</tr>
<tr>
<td>QDS-825C</td>
<td>8 m (25')</td>
<td></td>
<td>8 pin</td>
<td>2 Or/Bk</td>
<td>2 Bu</td>
<td></td>
</tr>
<tr>
<td>QDS-850C</td>
<td>15 m (50')</td>
<td></td>
<td>8 pin</td>
<td>3 Or</td>
<td>3 Wh/Bk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8 m (25')</td>
<td>8 pin Mini-style Female connector on one end, cut-to-length.</td>
<td>20 gauge</td>
<td></td>
<td></td>
<td>8 pin Mini-style Female connector on one end, cut-to-length.</td>
</tr>
</tbody>
</table>

**Unterminated bulk cable available (UTB-3...C, UTB-5...C, UTB-8...C) in 25', 50', 100', and 250' lengths. See below.**

**The SAE H1738-2 pin assignment and color codes are listed as a customer courtesy. The user must verify suitability of these cables for each application.**

### Unterminated Bulk Cable

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Length</th>
<th>Wire</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTB-825C</td>
<td>8 m (25')</td>
<td>20 gauge</td>
<td>8-conductor, unterminated bulk cable</td>
</tr>
<tr>
<td>UTB-850C</td>
<td>15 m (50')</td>
<td>20 gauge</td>
<td>8-conductor, unterminated bulk cable</td>
</tr>
<tr>
<td>UTB-8100C</td>
<td>30 m (100')</td>
<td>20 gauge</td>
<td>8-conductor, unterminated bulk cable</td>
</tr>
<tr>
<td>UTB-8250C</td>
<td>75 m (250')</td>
<td>20 gauge</td>
<td>8-conductor, unterminated bulk cable</td>
</tr>
</tbody>
</table>
## DUO-TOUCH® Run Bar with STB Buttons

### Replacement Parts

#### STB Self-Checking Touch Buttons

<table>
<thead>
<tr>
<th>Models</th>
<th>Description</th>
<th>Product</th>
</tr>
</thead>
</table>
| STBVP6-78974  | • Solid-state complementary PNP outputs  
• Polysulfone upper housing  
• 300 mm (12"), 4-wire PVC-jacketed cable | ![Image] |

#### E-Stop Push-Button Components

<table>
<thead>
<tr>
<th>Models</th>
<th>Description</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSA-EBM-02L</td>
<td>Metal E-stop button with 2 N.C. contacts</td>
<td>![Image]</td>
</tr>
</tbody>
</table>
| 8-LM2T-B6644 | 22.5 mm metal button (mounting adapter sold separately).  
Twist to release, mechanical latching ISO 13850 (EN 418) compliant.  
Diameter 40 mm (without mounting adapter). | ![Image] |
| 8-LM2T-AU120 | Metal mounting adapter for metal button                                    | ![Image] |
| 8-LM2T-C01   | Normally closed (NC) positively driven contact element.  
Direct (positive) opening operation per IEC/EN 60947-5-1. | ![Image] |
| 8-LM2T-C10   | Normally open (NO) auxiliary contact element                                | ![Image] |
| 8-LM2T-AU115 | 60 mm diameter, non-adhesive plastic legend with “Emergency Stop” inscription | ![Image] |

#### Telescoping Stand Component

<table>
<thead>
<tr>
<th>Models</th>
<th>Description</th>
<th>Product</th>
</tr>
</thead>
</table>
| STBA-RB1-SGP | Quick-release gravity pin to allow rotation of Run Bar on telescoping stand.  
(Can also be used for quick height adjustment of stand.) | ![Image] |